Occurrence of dental caries in primary and permanent dentition, oral health status and treatment needs among 12-15 year old school children of Jorpati VDC, Kathmandu

Shrestha N,[1] Acharya J,[2] Sagtani AR,[2] Shrestha R,[3] Shrestha S [4]

[1]Lecturer, Department of Conservative Dentistry and Endodontics, [2]Lecturer, Department of Community and Public Health Dentistry. [12]College of Dental Sciences, Nepal Medical College, Attarkhel, Jorpati, Kathmandu. [3]Lecturer, Department of Conservative Dentistry and Endodontics, Dhulikhel Hospital, Kathmandu University School of Medical Sciences, Dhulikhel. [4]Lecturer, Department of Conservative Dentistry and Endodontics, Kantipur Dental College and Hospital, Kathmandu.

Corresponding Author: Dr Nameeta Shrestha, Lecturer, Department of Community Dentistry, College of Dental Sciences and Hospital, Nepal Medical College, Jorpati, Kathmandu, Nepal.

ABSTRACT

Dental caries occurrence, distribution, oral health status and corresponding treatment needs in 12- 15 year old children are useful tools for evaluation of oral health. Dental caries status along with its treatment needs was recorded according to World Health Organization (WHO) index (1997) in 366 children from five schools within Jorpati Village Development Committee (VDC), Kathmandu. Dental caries was diagnosed in 156 (42.6%) children, out of which122 (78.21%) had caries in permanent teeth, 26 (16.67%) had caries in primary teeth, and 8 (5.13%) had caries in both dentition. The age wise distribution of dental caries showed the highest prevalence among 12 year old students (23.8%) and the lowest among 15 year olds (3.8%). Among the female students (177), 43.5% showed presence of dental caries, while the prevalence among male students (179) was 41.8%.Out of the total number of teeth affected by dental caries (336), 273 (81.25 %) were permanent teeth and 63 (18.75%) were primary teeth. The intra arch distribution of dental caries in permanent as well as primary dentition was statistically significant ($P < 0.05$).Restorative treatment (89.38%) was the main need in permanent dentition, and endodontic treatment (60.32%) in primary dentition. Chronologic enamel hypoplasia was found in 14 (3.83%) of the total population, and 62 (16.94%) required oral prophylaxis. These findings are significant as they can initiate further research in this area, which may help establish reliable baseline data for implementation of preventive oral health programs.

Keywords: Dental caries, prevalence, school children, treatment needs.

INTRODUCTION

Dental caries is the most prevalent dental affliction in humans.[1] Information on epidemiological figures of dental caries is required to update our knowledge on changing trends of the disease and its treatment needs. This may help in understanding ways and means to prevent its onset and limit its progression. Dental caries is often responsible for the absenteeism from school and loss of working hours. The lack of availability of dental care and postponement of treatment due to cost considerations not only results in aggravation of the disease, but also enhances the cost of treatment and care.[2] School age is an influential stage in peoples' lives, a time when lifelong sustainable oral health-related behavior, as well as beliefs and attitudes, are being developed.[3] Children are particularly receptive to health messages during this period, and the earlier the good habits are established, the longer lasting the impact.[4]

Jorpati is a village on the outskirts of Kathmandu valley, with a population of 84,567 according to the 2011 census.[5] Since there have been no earlier studies in this area, this cross sectional study was done with the objective of determining caries prevalence, distribution and treatment needs in 12-15 year old school children of Jorpati Village Development Committee (VDC), one of the sixty VDCs located in Kathmandu valley.

MATERIALS AND METHODS

This study was conducted in Jorpati VDC of Kathmandu valley. Non probability sampling was conducted to select five schools out of the total of 46 schools within this VDC. A study done in Nepal showed the caries prevalence among 12-13 and 15-16 year olds to be 25.6% which was the prevalence used for estimating the sample size in this study.[6] A total of 366 students were included in the study using the formula for sample size estimation.[7] Informed consent was then obtained from the concerned authorities. The inclusion criteria comprised of children between age group 12-15 years, those that were willing to participate in the study and had a pre-signed consent form. Children who were physically/mentally disabled, and those who were not willing to participate, or did not receive permission from their parents/guardians were excluded from the study. Age was recorded as age at last birthday, rounded off to six months, and this information

was taken from the school admission records.

The students were screened for evaluation of dental caries using mouth mirror and blunt probe under natural illumination in a classroom setting, as per the standards of the World Health Organization Oral Health Survey protocol. Dental examination was done and classified using the WHO criteria of 1997. The decayed, missing and filled teeth were recorded and scored with the Decayed, Missing and Filled Teeth (DMFT) index. The treatment needs were recorded and categorized as follows:[8]

Category 1: Carious teeth needing extraction.

Category 2: Carious teeth needing restoration including deep caries management.

Category 3: Carious teeth with pulp exposure requiring endodontic treatment.

Oral hygiene status was evaluated on the basis of presence/absence of stains, plaque and calculus. Abnormalities or developmental defects that were evident during screening were also recorded.

The data obtained was tabulated and analyzed using Software Package for Social Science (SPSS) version 19. Descriptive Statistics was calculated, and Pearson's Chi Square test and Fischer Exact Test were used to test levels of association.

RESULTS

A total of 366 school children aged 12 to 15 years were studied. Of this number, 189 (51.64%) were boys and 177 (48.36%) were girls. Dental caries was diagnosed in 156 (42.6%) children, out of which 122 (78.21%) had caries in permanent teeth, 26 (16.67%) had caries in primary teeth, and 8 (5.13%) had caries in both dentitions (Fig. 1).

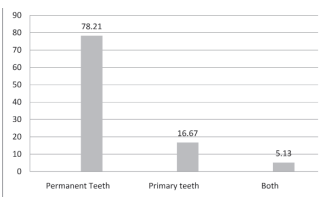

Fig. 1: Occurrence of dental caries by dentition (%) among children aged 12-15 years of Jorpati (n=366)

The age wise distribution showed that 51.6% of children belonged to the age group of 12 years, 22.1% were 13, 18% belonged to the age group of 14 and 8.2% were 15 years old. There was a general decrease in the caries prevalence with age, with the highest prevalence among the 12 year old students (23.8%), while the lowest was observed among the 15 year olds (3.8%), as represented in Table 1. However, the difference in the occurrence of dental caries with age was not statistically significant (P value > 0.05).

Table-1: Dental caries prevalence by age among 12-15 year old children of Jorpati (n=366)

Variable	Dental caries prevalence				
Age (years)	Absent		Present		P-value*
	n	%	n	%	
12	102	27.9	87	23.8	0.40
13	52	14.2	29	7.9	
14	40	10.9	26	7.1	
15	16	4.4.	14	3.8	
Total	210	57.4	156	42.6	

*P-value taken from Pearson's Chi Square Test

Gender wise distribution of caries showed that among 177 female students, 43.5% showed presence of dental caries, while the prevalence among 179 male students was 41.8%. However, this was not statistically significant (P > 0.05) (Fig. 2).

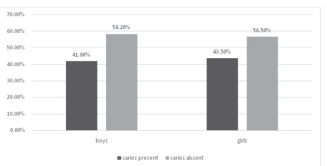

Fig. 2: Dental caries prevalence by gender among 12-15 year old children of Jorpati VDC (n=366)

Out of the total number of teeth affected by dental caries (336), 273 (81.25 %) were permanent teeth and 63 (18.75%) were primary teeth. Of the permanent teeth affected (273), dental caries was most prevalent in the first molars (71.43%), followed by the second molars (17.22%). The least carious teeth were the canines (0.73%), as shown in Table 2. Dental caries occurred more often in the mandibular first molars (65.64%) than in the maxillary first molars (34.36%).

Table-2: Dental caries prevalence in permanent teeth among children aged 12-15 years of Jorpati (n=273)

Tooth	Prevalence (%)
Permanent First Molars	71.43
Permanent Second Molars	17.22
Permanent Second Premolars	3.66
Permanent First Premolars	2.93
Permanent Central Incisors	2.20
Permanent Lateral Incisors	1.83
Permanent Canines	0.73
Total	100.0

Out of the total number of primary teeth affected (63), dental caries was most prevalent in the primary second molars (60.32%), followed by the first molars (30.16%), as presented in Table 3. Dental caries occurred more often in the primary mandibular second molars (52.63%) than in the maxillary second molars (47.37%).

Table-3: Dental caries prevalence in primary teeth among children aged 12-15 years of Jorpati VDC (n=63)

Tooth	Prevalence (%)
Primary second molars	60.32
Primary first molars	30.16
Primary canines	9.52
Primary lateral incisors	0
Primary central incisors	0
Total	100.0

The intra arch distribution of dental caries in the upper arch of permanent dentition showed a significantly higher caries prevalence on the right side than on the left (upper right: 20.52%, upper left: 20.15%), whereas, in the lower arch, the left side showed a higher prevalence of caries than the right side (lower right: 27.85%, lower left: 31.50%).These were statistically significant ($P < 0.05$) as depicted in Table 4.In primary dentition, the occurrence of dental caries on the right side of the upper as well as lower arches were significantly higher (upper right: 26.99%, lower right: 30.15%) than on the left side (upper left: 25.40%, lower left: 15.88%). Both were statistically significant ($P < 0.05$) as they appear in Table 4.

Table-4: Intra arch distribution of dental caries by dentition:

Variable	N	Prevalence (%)	P-Value*
Upper Right Arch -Permanent	53	20.52%	0.000
Upper Left Arch - Permanent	58	20.15%	
Lower Left Arch - Permanent	86	31.50%	0.000
Lower Right Arch - Permanent	76	27.85%	
Upper Right Arch - Primary	17	26.99%	0.000
Upper Left Arch - Primary	16	25.40%	
Lower Left Arch - Primary	11	15.88%	0.012
Lower Right Arch - Primary	19	30.15%	

*P-value taken from Fischer Exact Test

Out of the 273 carious permanent teeth, 244 teeth (89.38%) needed restorative treatment (Category 2), majority of which were one surface restorations. Endodontic treatment (Category 3) was required in 22 (08.06%) of the carious teeth because they had pulp exposures, and 7 teeth (2.56%) needed extraction (Category 1). Of the 63 carious primary teeth, 25 teeth (39.68%) needed extraction (Category 1), and 38 teeth (60.32%) required dental treatment consisting of pulpectomy or pulpotomy (Category 3) (Fig. 3).

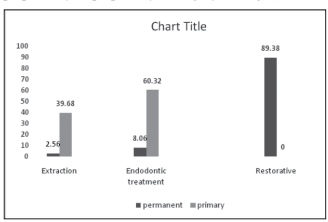

Fig. 3: Treatment needs of children aged 12-15 years of Jorpati VDC

Chronologic enamel hypoplasia was found in 14 (3.83%) of the total population. Regarding the oral hygiene of the respondents, 17.2% displayed evidence of stains, plaque and calculus, portraying poor oral hygiene on their part, and requiring oral prophylaxis.

DISCUSSION

Oral health, although an integral part of general health, is one of the most neglected. With the trend towards increasing prevalence and severity of dental caries, information concerning dental caries prevalence and oral hygiene status would assist in the development of oral health programs.[6,9]

In our study, out of the total children studied (366), dental caries was diagnosed in 156 (42.6%).Similar studies conducted in Nepal revealed a high caries prevalence in the range of 52.46 – 60.3%.[10-13]A recent study done among public school children in Eastern Nepal by TK Bhagat revealed a prevalence of 60.3% and 55.6% in primary and permanent dentition respectively.10A hospital based study done by Adhikari RBin Western Nepal showed a caries prevalence of 52.46% among school-going children aged 11-14 years.[11] Subedi B *et al.,* studied 12-13 year olds from 30 schools within Kathmandu valley and revealed a high caries prevalence of 53.23%.[12] Khanal S reported dental caries as the predominant oral disease in 80.6% of children aged 1-14 years in a hospital based study.[13]

The age group of 12- 15 years was selected in our study because the age of 12 years has been universally accepted as the global monitoring age for caries since all permanent teeth except for the third molars would have erupted by this age. By the age of 15 years, the dietary habits of the individuals are more or less established, hence permanent teeth would have been exposed to the oral environment since 3-9 years, thus making the assessment of caries prevalence more meaningful at this age.[14] In our study, prevalence of dental caries was found to decrease with increase in age. The gradual reduction in number of cariogenic bacteria has been shown to accompany the transition of late mixed dentition.[15,16] This finding is different from those obtained in other studies, where higher caries prevalence was found with increase in age.[12, 17-19] The reason for the higher prevalence of dental caries at 15 years as compared to 12 years is that caries being a continuous and cumulative process had increased over a span of 3 years, and the number of teeth is more at the age of 15 years.[2,20]

Higher prevalence of caries was observed in females than in males, which is in agreement with findings of other studies.[21,22] Mansbridg reviewed several studies presenting data about the gender gap regarding caries, and most researchers attribute this difference to the fact that, in general, permanent teeth erupt earlier in women than in men.[23]

The results showed that the first permanent molars were the most carious teeth in permanent dentition. This could be attributed to the fact that they are the first permanent teeth to erupt in the oral cavity and bear maximum occlusal load.[24] This tooth is more vulnerable to caries than others because of its functional and morphological characteristics.[25] The other important finding was that mandibular first permanent molar exhibited more caries prevalence than their maxillary counterpart. This finding is concurrent with a study conducted by Serban, Maxim and Balan.[26] Thiscould be because the mandibular first permanent molar has more number of pits and supplementary grooves which can act as food retentive areas promoting caries. The other factor could be that in majority of children, mandibular first permanent molar erupts slightly earlier than its maxillary counterpart. Hence, the former is exposed to the oral environment for a longer period of time, making it more susceptible to caries.[27]

In primary dentition, the second primary molars showed the greatest vulnerability to caries, and this finding corroborates previous studies.[28,29] This may be accredited to the morphology of these teeth and their broader/flatter interproximal contacts.[30] The pits and fissures in second primary molars are deeper and less completely coalesced.[31,32] The food packing potential, greater plaque accumulation and difficult access for effective oral hygiene could be responsible for the increased susceptibility of caries in the mandibular molars, in contrast to the relative abundance of saliva and its anti-carious effect in the maxillary molar teeth.[33]

The intra arch distribution of dental caries in the lower arch of permanent dentition showed a significantly higher caries prevalence on the left side than on the right. Similar results were found in another study done by Bhardwaj VK among children living in Himachal Pradesh, India.[34] The upper arch in permanent dentition showed a significantly higher caries prevalence on the right side than on the left. Similarly, in primary dentition, the occurrence of dental caries on the right side of the upper as well as lower arches were significantly higher. The reason for this could be the possibility of a greater attention being paid to the left sides of both jaws during oral prophylactic procedures and masticatory processes. A study has shown that approximately 94.6% of the children that were right-handed concentrated more on cleaning the surfaces of maxillary and mandibular left posterior teeth than the right ones.[35] Studies have also shown that those sides of the jaws that are frequently well

cleaned and used during mastication usually show less microbial deposits as compared with those sides that are less frequently used and cleaned.[36,37] The tendency for higher deposition of plaque on those teeth may be due to lack of shearing occlusal and tooth brushing forces which are very important in the mechanical removal of plaque. Therefore, a higher prevalence of tooth decay on the right sides of the jaws could be a reflection of a lower level of tooth cleanliness.[29]

The evaluation of the treatment needs in the children revealed that the requirement for one surface restoration was maximum, followed by two or more surface restorations. This finding corresponds with those of Munjal V, who reported that the highest treatment need among 12 and 15 year old school children were single surface restorations.[38] Mandal KP also showed that in all age groups, the need for single surface restoration was maximum, indicating lack of restorative treatment, preventive oral care facility, and awareness among the population.[39] Similar results of need for single surface restorations were also shown by Rodrigues JS and by Kulkarni SS in their respective studies.[40,41] Likewise, Adhikari RB also found one surface filling as the major treatment need in children aged 5-14 years in Western Nepal.[11]

The data from our study indicates that the prevalence of dental caries was low in primary dentition compared to permanent dentition, with the highest caries prevalence and treatment need being in the age group of 12 years. The dominant treatment need in permanent dentition was restoration, whereas endodontic treatment was the main need in primary dentition. The overall caries prevalence in our study was within our national goal, and the goal recommended by WHO, of at least 50% caries free children.[6,42]

To prevent occurrence of dental caries among younger children, parental education on diet modification, improvement in oral hygiene practices and regular dental visits should be encouraged. Diet is a major factor contributing to dental caries prevalence, and therefore, adequate dietary counseling is a must. Children should be explained in detail about harmful effects of various kinds of food, especially refined carbohydrates and sugars in the form of sticky food. Frequency of sugar exposure should be reduced, and children should be educated to consume sweet food strictly at meal times. Implementation of school dental health programs, along with focus on preventive programs like proper tooth brushing techniques and fluoride mouth rinse are recommended. Preventive services should be given high priority, and started at an early age to target the primary dentition and avoid future caries in permanent dentition.[20] Regular interval screening programs to assess the oral health and treatment needs of school children with treatment as per the need is also recommended. Dental caries prevalence level must be brought lower by adopting cost effective preventive measures directed particularly at younger children. Professional colleges should teach dental students to educate the general population about prevention of dental caries, rather than just cure. They should also highlight the importance of maintaining healthy milk teeth in the development of a child.[38]

The limitation of this study includes the lack of use of radiographs to detect interproximal caries. As a result, caries figures may be an underestimation of the true caries prevalence, which may have been different if radiographs were used.

To conclude, in spite of the shortcomings of this study, this could be the basis for encouraging further research in this area, so that reliable baseline data may be available for development of oral health programs for school children living in Kathmandu valley.

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